Painful temporomandibular disorders (TMD) and comorbidities in primary care : associations with pain-related disability

Kotiranta, Ulla

2019-01-02

Kotiranta , U , Forssell , H & Kauppila , T 2019 , ' Painful temporomandibular disorders (TMD) and comorbidities in primary care : associations with pain-related disability ' , Acta Odontologica Scandinavica , vol. 77 , no. 1 , pp. 22-27 . https://doi.org/10.1080/00016357.2018.1493219

http://hdl.handle.net/10138/311660
https://doi.org/10.1080/00016357.2018.1493219

acceptedVersion

Painful Temporomandibular Disorders (TMD) and comorbidities in primary care: associations with pain-related disability

KOTIRANTA ULLA[1,4], FORSSELL HELI[2] & KAUPPILA TIMO[3,4]

Original research

[1]Department of Oral and Maxillofacial Diseases Institute of Dentistry, Kuopio University Hospital, University of Eastern Finland, Kuopio, Finland, [2]Institute of Dentistry, University of Turku,Turku, Finland, [3]Department of general practising and primary care, University of Helsinki, Helsinki, Finland, and [4]Health and Social Bureau, City of Vantaa, Vantaa, Finland

Correspondence: Timo Kauppila

Department of general practising and primary care, Clinicum, University of Helsinki

Biomedicum II, Tukholmankatu 8B, FI-00014 University of Helsinki, Helsinki, Finland

Health and Social Bureau, City of Vantaa, Peltolantie 2D

01300 Vantaa, Finland

timo.kauppila@fimnet.fi or timo.kauppila@helsinki.fi , ORCID: 0000-0002-6155-0300

Conflict of interest

The authors report no conflicts of interest.

Running head: TMD pain and comorbidities in primary care

Ethics statement/confirmation of patient permission: The research protocol was approved by the Ethics committee of Turku University, and the health authorities of the City of Vantaa. The experiments were undertaken with the understanding and written consent of each subject and according to the ethical principles of the World Medical Association Declaration of Helsinki (2002).

Word count 3056, number of tables 4

ABSTRACT

Objective We studied whether primary care temporomandibular disorder (TMD) patients reporting different levels of pain-related disability differ in terms of comorbid pains, general health conditions, and quality of life.

Material and Methods Consecutive TMD pain patients (n = 399) seeking treatment in primary care completed a questionnaire on comorbid pains and their interference and the Finnish version of the RAND-36-item quality of life questionnaire. Medical diagnoses confirmed by doctors were recorded. The patients were classified according to the Graded Chronic Pain Scale (GCPS) of the Research Diagnostic Criteria for TMD (RDC/TMD). The patients were classified: no disability group (0 disability points), low disability group (1–2 disability points) and high disability group (3–6 disability points).

Results Compared to patients in the no-disability group, patients in the high- and low-disability groups reported more comorbid pain conditions($P<0.001$), and experienced these as more intense and interfering more with daily life($P<0.05$). Patients in the high-disability group reported more general health-related medical diagnoses than patients in the no-disability group($P<0.05$). Furthermore, patients with low or high pain-related disability indicated poorer quality of life in all RAND-36 subscales than those with no disability ($P<0.05$).

Conclusion The findings suggest that GCPS-related disability scoring can be used as a simple screening instrument to identify TMD patients with different degrees of health burdens.

Key words: Disability evaluation, Chronic pain, Comorbidity, Temporomandibular disorders, Quality of life

Word count 214

Introduction

Temporomandibular disorders (TMD, i.e. masticatory muscle and temporomandibular joint pain and dysfunction) is a common reason for seeking care [1]. The prognosis of TMD is mostly favorable [2,3], and the pain of the majority of patients is relieved by simple treatments [4]. Some patients, however, suffer from complicated or persistent pain symptoms [2,5].

Attention has lately been paid to the relations of TMD pain to other pain conditions [6] or general health problems [7]. Comorbid pains or health problems complicate the nature of TMD; comorbidities increase the risk of pain chronicity and impair the treatment outcomes [2,8,9]. Pain-related pathophysiological mechanisms may be different in patients suffering from regional symptoms compared to patients with multiple pain conditions [10], and these patient groups might even differ genetically [11]. The expression of comorbid pains may also differ due to cultural influences [12].

Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) is the most common method used to diagnose and classify TMD pain patients. In this dual axis system, the Axis II psychosocial assessment uses Graded Chronic Pain Scale (GCPS) to measure the extent of pain intensity and the degree to which the pain is disabling [13]. TMD pain-related disability is associated with psychosocial factors [14-18]. The association of pain-related disability with comorbid pain conditions and general health factors has been explored in only a few studies. The more disabled patients have been found to report more widespread pain [8], more bodily pain [15], to rate their general health as poorer [14,17], and to use more health services [14]. The association of pain-related disability with comorbid pains, general health factors and health-related quality of life have not been studied in patients seeking care for TMD pain in primary care, though the majority of these patients are treated in primary care or by general dental practitioners [19].

The aim of the present study was to investigate comorbid pains, general health conditions, quality of life, and use of health services of TMD pain patients in primary health care, and to study associations of these factors with pain-related disability based on GCPS of the RDC/TMD.

Material and methods

Study participants

This study was performed at the Department of Oral Health Care in Vantaa Health Centre, a public primary health care organization with 200,000 inhabitants in the City of Vantaa, Finland. During a 1.5 year time period (June 2010 - November 2011), all 18-70-year-old consecutive patients contacting Oral Health Care because of oral or facial pain were screened for possible TMD pain using validated screening questions, as described earlier [18]. One trained dentist (UK) examined the patients to confirm the clinical diagnosis according to the RDC/TMD criteria. Exclusion criteria included TMD pain conditions related to acute trauma or rheumatoid or other inflammatory arthritis and any physical or mental condition that would interfere with the ability to complete the study questionnaire. Before inclusion in the study the patients gave their informed consent. Eleven of the total of 410 eligible patients refused to participate. The mean age of the 399 included patients was 40.5 years (SD±12.7), and 83% of them were women.

Subtyping of TMD patients

The data was collected using the Finnish version of the RDC/TMD Axis II questionnaire (RDC/TMD_FIN) [20] completed by the patients at the initial visit, after the confirmation of the TMD diagnosis. RDC/TMD Axis II GCPS was used to assess pain severity and disability [13]. The patients were analyzed in three groups based on the GCPS disability scores in accordance with the results of our prior studies [17,18] as follows: 1) no-disability group, i.e. Grade I and II patients with no disability points, 2) low-disability group, i.e. Grade I and II patients with 1-2 disability points, and 3) high-disability group, i.e. Grade III and IV patients with 3–6 disability points. From the 399 patients, 242 (61%) belonged to the *no-disability group*, 108 (27%) to the *low-disability group* and 49 (12%) to the *high-disability group*.

Comorbid pain conditions

The patients were asked about comorbid pain conditions, and their impact. The questions were adopted and modified from Von Korff et al. [21] and from the Comorbid Pain Conditions questionnaire (www.rdc-tmdinternational.org). The patients were asked about whether in the past six months they had had headache, back pain, neck pain, joint pain, abdominal pain, chest pain or fibromyalgia pain and in affirmative cases to indicate for each pain separately:

1) Pain intensity: “In the past six months, on average, how intense was your pain on a 0 to 10 scale from “no pain” to “pain as bad as could be” ?

2) Days in pain: “How many days in the last six months have you been kept from your usual activities (work, school or housework) because of the pain?”
3) Pain interference: In the past six months, how much has the pain interfered with your daily or recreational activities, or your ability to work on a 0 to 10 scale from “no interference” to “unable to carry on any activities”?
4) Sick leave: “How many days in the last six months have you been on sick leave because of the pain?”
5) Use of health services: “How many times in the last six months have you consulted a doctor or other health professional because of the pain?”

Medical diagnoses

Furthermore, the patients were asked by the examining dentist to report all doctor confirmed medical diagnoses of sicknesses from the list that follows they had now or in the past.

The medical diagnoses were grouped into 12 categories. Each category included one or more medical conditions; *endocrine* (e.g. diabetes, thyroid disease), *cardiovascular* (e.g. cardiologic conditions, blood pressure), *hematologic* (e.g. bleeding disorder), *neurosensory* (e.g. epilepsy, nerve lesions, neurologic disease), *respiratory* (e.g. asthma, allergy, pulmonary disease), *musculoskeletal* (e.g. rheumatoid arthritis, fibromyalgia, arthrosis, back disease), *headache* (e.g. tension headache, migraine), *gastrointestinal* (e.g. irritable bowel syndrome, gastric ulcer, diseases of liver), *sleep* (e.g. sleep disorder, sleep apnea, snoring), *psychiatric* (e.g. depression, panic disorder, psychotic and other mental disorders), *cancer* and *other conditions.*

Quality of life

General health-related quality of life was assessed by the Finnish version of RAND-36-item health survey 1.0 [22]. This 36-item self-report inventory assesses both mental and physical health-related quality of life. It includes eight health concepts: *physical functioning, physical role functioning, psychological well-being, psychological role functioning, social functioning, vitality, self-rated general health,* and *bodily pain*. The scores of every subscale range from 0 to 100, with higher scores indicating better health states.

Statistical analyses

The three GCPS groups were compared with each other in studied parameters. The statistical analysis was performed with Kruskal-Wallis One Way Analysis of Variance on Ranks followed by

Dunn's test or $\chi 2$-test depending on the nature of the analyzed factor [23,24] as described earlier [25]. Intensity of pain, number of days suffered from pain and factors describing its' interference with everyday life, visits to doctors and amount of sick leave, as well as scores of the quality of life were analyzed with One- Way ANOVA on ranks. Occurrence of comorbid pain conditions and comorbid diagnoses were analyzed with $\chi 2$-test. A *P* value less than 0.05 was considered to mean a statistically significant difference.

The amount of missing data was very low: the response rates reached 100% in all other questionnaire and interview questions, but in the RAND-36 questionnaire there were missing data from 1-2 participants.

Results

Comorbid pain conditions

All patients, except for one patient in the no-disability group, reported comorbid pains. The mean (SD) number of reported comorbid pains was 3.9 (±1.3). Patients in the no-disability group reported on an average 3.6 (±1.2) comorbid pains, while the corresponding numbers were 4.2 (±1.3) in the low, and 4.6 (±1.4) in the high-disability groups. The number of comorbid pains was significantly lower in the no-disability group compared to the low- ($P<0.001$) and the high- ($P<0.001$) disability groups. In regard to the occurrences of most of the reported individual comorbid pain conditions, there were no significant group differences. The percentages of patients reporting chest pain and abdominal pain increased from the no-disability group through the low- to the high-disability group with statistically significant differences between the no- and the low-disability groups and the no- and the high-disability groups (Table 1).

Table 2 presents the combined median values of pain intensity and pain interference of comorbid pain conditions, as well as days in pain and on sick leave, and visits to doctors because of comorbid pains. Pain intensity and pain interference, and the number of days in pain increased from the no-disability group through the low-disability to the high-disability group with statistically significant differences between all groups. Furthermore, patients in the high-disability group reported significantly more days on sick leave compared to patients in the no-disability group, and significantly more visits to doctors compared to patients in the no-and low-disability groups.

General health related medical diagnoses

Different types of medical diagnoses were reported by 89% of the patients. Allergy was the most frequent single medical diagnosis reported by the patients (49%), followed by migraine (15%), asthma (14%), high blood pressure (12%), diabetes (11%), depression (11%) and cardiovascular diseases (7%). Snoring was reported by 23%, sleep disorders by 21%, and sleep apnea by 2.3 % of the patients. No significant differences were found in the occurrence of medical diagnoses between the no- (87%), low- (92%) and the high- (96%) disability groups. However, the number of reported diagnostic categories was significantly higher in the high-disability group (median 3, IQR 25-75%: 2.5-5.0) than in the no-disability group (median 2, IQR 25-75%: 1.0-3.0) (P< .05). Comparison of the medical diagnoses in the 12 categories showed significant differences between the disability groups in three categories: endocrine, cancer and neurosensory diseases (Table 3).

Significant group differences were found in five single diagnoses. Patients in the high-disability group reported significantly more depression (P<0.01) and nerve lesions (P<0.001) compared to patients in the no- disability group, and more diabetes compared to patients in the no- (P<0.01) and the low- (P<0.05) disability groups. Patients in the no-disability group reported significantly less (P<0.05) fibromyalgia diagnosis compared to patients in the low- and the high-disability groups. Asthma was significantly (P<0.05) more common in the low-disability group than in the no-disability group.

General health related quality of life

Overall, the quality of life was significantly better among patients reporting no pain-related disability compared to those with low or high pain-related disability in all RAND-36 subscales as presented in Table 4.

Discussion

Main findings

The results of the present study indicated that patients reporting different levels of pain-related disability also differ in terms of comorbid pain conditions and general health-related factors. Patients reporting higher levels of disability reported more comorbid pain conditions, more visits to doctors due to comorbid pains, and more general health-related medical diagnoses. The patients in the low- and high-disability groups experienced their comorbid pains as significantly more intense and interfering compared to patients in the no-disability group. Furthermore, patients with low or high pain-related disability indicated poorer quality of life as compared to those with no disability. Thus,

the GCPS-based disability scoring associated significantly with several factors relating to general health and well-being.

Comorbid pain conditions

Comparing the frequencies of comorbid pain conditions presented in the literature with the present findings is challenging due to e.g. differences in study samples, study settings and case definitions. Two recent reviews reported that the four most common comorbid pain conditions in TMD were migraine (12%-61%), headache (35%-89%), neck pain (54%-68%) and back pain (16%-64%) [6,26]. Compared to these figures, the occurrences of comorbidities in the present study are near the upper limits of these reference values, whereas they are approximately of the same magnitude as the prevalence of comorbid pain complaints in a recent large population-based study [27]. Fibromyalgia was reported by only 5.8% of the present patients, which is a much lower figure than that presented earlier [6]. In a recent study participants with mild TMD symptoms reported on average 4.3 comorbid pains, and those with severe TMD pain complaints, 4.6 comorbid pains, the total number of pains ranging from 0 to 8 [27]. These figures may be comparable with the numbers of the low-disability patients (4.2 pains) and the high-disability patients (4.6) of the present study.

Only a few studies have examined the associations of comorbid pains with TMD pain-related disability as was done in the present study. Supporting our findings, Yap et al. [15] found significant and positive correlation between the number of other pain conditions and graded chronic pain severity. In a recent case-control study TMD patients with two or more comorbid pain conditions reported significantly elevated pain scores on GCPS, as assessed for both TMD pain and other pains, compared to patients with no, or only one, comorbid pain condition [28]. In the present study the more disabled TMD patients also experienced their comorbid pains as more bothersome compared to patients reporting less disability. An association between TMD pain-related disability and pain comorbidities has also been found in prospective studies demonstrating increased risk for dysfunctional pain (as measured using the GCPS scale) with widespread pain [8,29].

Medical conditions

The number of reported medical conditions was high (89%), as in previous studies [30]. Allergy was the most frequently reported single medical diagnosis. Respiratory conditions including allergy have been shown to occur in TMD patients more frequently compared to controls [9], and to predict first-

onset TMD [7]. The second most frequently reported single medical diagnoses were those related to sleep. Approximately one- to two-thirds of TMD patients are reported to suffer from sleep disturbances [31]. Clinical insomnia has been suggested to play a pathophysiological role in TMD etiology [32]. Only 2.3 % of the present primary care patients reported having a sleep apnea diagnosis, which is a considerably lower figure compared to the findings of a polysomnographic evaluation where 28% of TMD pain patients were diagnosed with sleep apnea in a pain clinic [32].

To the best of our knowledge, there exist no previous studies concerning the association between general health-related factors and TMD pain-related disability except for the finding that the more disabled patients rate their general health as poorer compared to more functional TMD patients [14,17]. The present study gave comparable results; patients in the high-disability group estimated their general health as significantly poorer compared to patients in the low-disability group, and to those in the no-disability group. The number of reported diagnostic categories was significantly higher in the high-disability group than in the no-disability group. In an earlier study, a larger number of medical conditions was found to differentiate TMD patients from controls [30].

High-disability patients reported more depression diagnoses compared to patients reporting no pain-related disability, which is in accordance with the findings in other studies [14-16]. Fibromyalgia, a condition considered to reflect generalized pain hyperexcitability, was more frequently reported by patients in the high- and low-disability groups compared to patients in the no-disability group.

General health-related quality of life

Physical and emotional functioning was shown to decrease significantly with the presence of TMD and with increased frequency of temple headache in an earlier study [33]. Liegey Dougall et al. [34] reported that TMD subjects who were estimated to have a high-risk of progressing to chronic TMD pain reported lower quality of life. There are no earlier studies on the general health-related quality of life in relation to TMD pain-related disability. In this study, patients in the no-disability group were significantly better functioning than patients in the other two groups regarding all RAND-36 subscales.

Methodological considerations

The original RDC/TMD assessment method has been revised and a new, evidence-based DC/TMD assessment protocol was published in 2014 [35]. As the material for the present study was collected before the publishing of the DC/TMD assessment protocol [35], the present study utilized the

original RDC/TMD assessment method. There is good evidence, however, for the reliability and validity of the RDC/TMD Axis II instruments [35]. Analogously, many different measures for health-related quality of life exist. We chose RAND-36 as the scoring method in our study because it is reported to be the most used method for determining quality of life [36].

The cross-sectional study design does not allow drawing conclusions as to the causality of the reported associations. The subjects of the present study were primary care TMD patients, possibly limiting the generalizability of the study findings to other patient samples, such as patients treated in secondary or tertiary care clinics, who usually suffer from more severe symptoms.

As for outcomes of medical diagnoses, we do not know how reliable the patients' reports of confirmed diagnoses can be considered compared to those collected from the patient register system. Patients were interviewed about medical diagnoses, which might increase the reliability. Presumably, due to this arrangement the amount of missing data remained very low.

Clinical implications

Patients reporting different levels of pain-related disability in the present study differed from each other so that patients in the high-disability group reported higher values and patients in the no-disability lower values on most of the assessed variables. The low-disability patients reported mostly values in-between these, and thus formed an intermediate group between the no- and high-disability groups. These findings extended our earlier findings on the psychosocial aspects of TMD pain in primary care [18], and provided further support for the subdivision of the GCPS grades to include the intermediate GCPS low-disability subgroup.

Comprehensive diagnostics of TMD patients is recommended as it enables individualized treatment planning where the aim is to match treatments with the complexity of the condition [6,34]. It is generally considered that TMD patients with comorbid conditions need comprehensive care performed by an interdisciplinary team [6]. However, based on the present study findings it seems that although the non-disabled TMD patients report many comorbid pains, they experience them largely as non-burdening. This may indicate that reporting other comorbid pains does not necessarily signal a complicated condition, and that when planning the treatments attention should also be paid to the impact of comorbid pains.

Conclusions

The GCPS-based disability scoring associated significantly with several factors relating to the general health and well-being. These results are complementary to our previous findings on the same primary care TMD patient sample indicating that GCPS-related disability scoring identifies patients with different, clinically relevant psychosocial subtypes [18]. The findings of the present study suggest that GCPS-related disability scoring can be used as a simple screening instrument to identify TMD patients with different degrees of burdens relating to general well-being to guide individualized treatment planning.

Acknowledgements

The study was supported by the Finnish Association for the Study of Pain and the Turku University Hospital fund for health sciences research.

References

1. Dworkin SF, Huggins KH, Truelove E, et al. Epidemiology of signs and symptoms in temporomandibular disorders: clinical signs in cases and controls. J Am Dent Assoc. 1990;120:273–281.
2. Rammelsberg P, LeResche L, Dworkin S, et al. Longitudinal outcome of temporomandibular disorders: a 5-year epidemiologic study of muscle disorders defined by research diagnostic criteria for temporomandibular disorders. J Orofac Pain. 2003;17:9–20.
3. Manfredini D, Winocur E, Ahlberg J, et al. Psychosocial impairment in temporomandibular disorders patients. RDC/TMD axis II findings from a multicenter study. J Dent. 2010; 38:765–772.
4. Ohrbach R, List T. Predicting treatment responsiveness: somatic and psychological factors. In: Greene CS, Laskin DM, editors. Treatment of TMDs bridging the gap between advances in research and clinical patient management. Chigaco (IL): Quintessence; 2013. p. 91–98.
5. Ohrbach R, Dworkin SF. Five-year outcomes in TMD: relationship of changes in pain to changes in physical and psychological variables. Pain. 1998;74:315–326.

6. Velly A, Schweinhardt P, Fricton J. Comorbid conditions: How they affect orofacial pain. In: Greene CS, Laskin DM, editors. Treatment of TMDs bridging the gap between advances in research and clinical patient management. Chigaco (IL), Quintessence; 2013. p. 47-56.
7. Sanders AE, Slade GD, Bair E, et al. General health status and incidence of first-onset temporomandibular disorder: the OPPERA prospective cohort study. J Pain. 2013 14; Suppl:12, 51–62.
8. John MT, Miglioretti DL, LeResche L, et al. Widespread pain as a risk factor for dysfunctional temporomandibular disorder pain. Pain 2003;102:257–263.
9. Ohrbach R, Fillingim RB, Mulkey F, et al. Clinical findings and pain symptoms as potential risk factors for chronic TMD: Descriptive data and empirically identified domains from the OPPERA case-control study. J Pain. 2011 12; Suppl:11, T27–T45.
10. Chen H, Nackley A, Miller V, et al. Multisystem dysregulation in painful temporomandibular disorders. J Pain. 2013;14:983-996.
11. Slade GD, Smith SB, Zaykin D, et al. 2013. Facial pain with localized and widespread manifestations: separate pathways of vulnerability. Pain. 2013;154:2335–2343.
12. Al-Harthy M, Michelotti A, List T, et al. Influence of culture on pain comorbidity in women with and without temporomandibular disorder-pain. J Oral Rehabil. 2017;44:415-425.
13. Dworkin S, LeResche L. Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. J Craniomandib Dis. 1992;6:301–355.
14. Von Korff M, Ormel J, Keefe FJ, et al. Grading the severity of chronic pain. Pain. 1992;50:133–149.
15. Yap AUJ, Chua EK, Dworkin SF, et al. Multiple pains and psychological functioning/psychologic distress in TMD patients. Int J Prosthod. 2002;15:461–466.
16. Manfredini D, Winocur E, Ahlberg J, et al. Psychosocial impairment in temporomandibular disorders patients. RDC/TMD axis II findings from a multicenter study. J Dent. 2010;38:765–772.
17. Suvinen TI, Kemppainen P, Le Bell Y, et al. Research diagnostic criteria Axis II in screening and as a part of biopsychosocial subtyping Finnish patients with tempromandibular disorder pain. J Orofac Pain. 2013;27:314–324.
18. Kotiranta U, Suvinen T, Kauko T, et al. Subtyping primary health care TMD patients based on RDC/TMD Axis II pain related disability – a step towards tailored treatment planning? J Oral Facial Pain Head Headache. 2015;29:126–134.

19. Ommerborn MA, Kollmann C, Handschel J, et al. A survey on German dentists regarding the management of craniomandibular disorders. Clin Oral Invest. 2010;14:137–144.

20. Suvinen T, Rantala M, Ahlberg J, et al. RDCTMD_FIN.2010. Available from: http//:www.rdc-tmdinternational.org.
21. Von Korff M, Dworkin SF, Le Resche L, et al. An epidemiologic comparison of pain complaints. Pain. 1988;32:173–188.
22. Aalto AM, Aro S, Aro AR, et al. RAND 36-item health survey 1,0. Suomenkielinen versio terveyteen liittyvän elämänlaadun kyselystä, Helsinki: Stakes. Aiheita. 1995;2.
23. Buse DC, Manack A, Serrano D, et al. Sociodemographic and comorbidity profiles of chronic migraine and episodic migraine sufferers. J Neurol Neurosurg Psychiatry. 2010;81:428–432.
24. Dominick CH, Blyth FM, Nicholas MK. Unpacking the burden: Understanding the relationships between chronic pain and comorbidity in the general population. Pain. 2012;153: 293–304.
25. Ruokonen H, Juurikivi A, Kauppila T, et al. R. Oral lichen planus and lichenoid lesion in oral squamous cell carcinoma. Acta Odont Scand. 2017;75:442-445.
26. Velly A, List T, Lobbezoo F. Comorbid pain and psychological conditions in patients with orofacial pain. In: Sessle BJ, editor. Orofacial Pain: Recent Advances in Assessment. Management, and Understanding of Mechanisms. Washington (DC), IASP Press; 2014. p. 53-73.
27. Visscher CM, Ligthart L, Schuller AA, et al. Comorbid disorders and sociodemographic variables in temporomandibular pain in general Dutch population. J Oral Facial Pain Headache. 2015;29:51–59.
28. Chen H, Slade G, Lim PF, et al. Relationship between temporomandibular disorders, widespread palpation tenderness, and multiple pain conditions: a case-control study. J Orofac Pain. 2012;13:1016–1027.
29. Velly AM, Look JO, Lenton PA, et al. The effect of fibromyalgia and widespread pain on the clinically significant temporomandibular muscle and joint pain disorders – A prospective 18-month cohort study. J Pain. 2010;11:1155–1164.
30. de Leeuw R, Klasser GD. Albuquerque RJ. Are female patients with orofacial pain medically compromised? J Am Dent Assoc. 2005;136:459–468.
31. Lavigne G, Smith MT, Denis R, et al. Pain and sleep. In: Kryger MH, Roth T, Dement WC editors. Principles and practice of sleep medicine. St. Louis (MS): Elsevier Saunders; 2011. p. 1442-1451.

32. Smith MT, Wickwire EM, Grace EG, et al. Sleep disorders and their association with laboratory pain sensitivity in temporomandibular joint disorder. Sleep. 2009;32:779–790.
33. List T, John MT, Orbach R, et al. Influence of temple headache frequency on physical functioning and emotional functioning in subjects with temporomandibular pain. J Orofac Pain. 2012;26:83–90.
34. Liegey Dougall A, Jimenez CA, Haggard RA, et al. Biopsychological factors associated with the subcategories of acute temporomandibular joint disorders. J Orofac Pain. 2012;26:7–16.
35. Schiffman E, Ohrbach R, Truelove E, et al. Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) for Clinical and Research Applications: recommendations of the International RDC/TMD Consortium Network and Orofacial Pain Special Interest Group. J Oral Facial Pain Head Headache. 2014;28:6-27.
36. Vetter TR. A primer on health-related quality of life in chronic pain medicine. Anesth Analg 2007;104:703-718.

Table 1. Comorbid Pain Conditions: Occurrences and Group Differences Among TMD Patient Subtypes with No, Low, or High Disability

	Frequency %			
Comorbid pain	**All**	**No-disability**	**Low-disability**	**High-disability**
Headache	90.2	88.8	92.6	93.9
Neck pain	85.7	83.1	91.6	87.8
Back pain	74.7	71.9	81.3	77.1
Joint pain	60.4	59.3	59.3	69.4
Chest pain	22.8	14.1	32.4[#]	44.9*
Abdominal pain	51.4	44.2	57.9[#]	73.5*
Fibromyalgia pain	5.8	3.8	7.8	10.6

*$P<0.001$ no vs. high disability group; [#] $P<0.05$ no vs. low disability group

X^2-test

Table 2. Comorbid Pain Conditions: Medians of Pain Data, Group differences Among TMD Patient Subtypes with No, Low, or High Disability

	Median (IQR)			
Pain data	**All**	**No-disability**	**Low-disability**	**High-disability**
Pain intensity (0-10)	3.0	2.6	3.6*	4.6*#
	(2.0-4.1)	(1.7-3.4)	(2.6-4.3)	(2.9-5.6)
Pain interference (0-10)	2.0	1.6	2.6*	3.7*#
	(1.8-3.0)	(1.0-2.4)	(1.8-3.6)	(2.1-5.0)
Days in pain (0-180)	3.0	1.0	4.0*	17.0*#
	(0.0-14.0)	(0.0-9.5)	(0.0-16.5)	(7.7-91.2)
Days on sick leave (0-180)	0.0	0.0	0.0	2.0*
	(0.0-3.0)	(0.0-2.0)	(0.0-4.0)	(0.0-15.0)
Visits to doctor	1.0	1.0	1.0	4.0*#
	(0.0-4.0)	(0.0-3.0)	(0.0-4.5)	(2.0-9.3)

*$P<0.05$ vs. no disability group; # $P<0.05$ vs. low disability group

IQR= interquartile range for 25-75%, Dunns' method

Table 3. Medical Diagnoses: Occurrences and Group Differences Among TMD Patient Subtypes with No, Low, or High Disability

	Frequency (%)			
Medical diagnosis category	**All**	**No-disability**	**Low-disability**	**High-disability**
Endocrine	7.2	4.5	7.4	20.4***#
Cardiovascular	18.0	16.1	21.3	20.4
Hematologic	1.5	2.1	0.9	0.0
Neurosensory	12.3	9.1	13.9	24.5**
Respiratory	51.4	52.9	49.1	49.0
Musculosceletal	26.0	24.0	29.6	28.6
Headache	16.8	13.6	20.4	24.5
Gastrointestinal	12.8	11.2	13.0	20.4
Sleep disorders	38.6	37.2	38.9	44.9
Psychiatric disorders	15.5	14.1	13.9	26.5
Cancer	3.5	3.7#	0.0	10.2##
Other	9.5	11.2	7.4	6.1

* $P<0.05$, ** $P<0.01$, *** $P<0.001$ vs.no disability group

# $P<0.05$, ## $P<0.01$ vs. low disability group, X^2-test

Table 4. Quality of Life. Medians of RAND-36 subscales and Group Differences Among TMD Patient Subtypes with No, Low or High Disability

	Median (IQR)		
RAND-36 subscale	**No-disability**	**Low-disability**	**High-disability**
Physical functioning	95.0 (85.0-100.0)	90.0* (75.0-100.0)	85.0* (58.8-96.3)
Physical role functioning	100.0 (50.0-100.0)	50.0* (12.5-100.0)	25.0* (0.0-75.0)
Psychological role functioning	100.0 (66.7-100.0)	100.0* (37.5-100.0)	66.7* (33.3-100.0)
Energy	70.0 (55.0-80.0)	55.0* (45.0-70.0)	50.0* (35.0-65.0)
Psychological well-being	80.0 (72.0-88.0)	72.0* (60.0-84.0)	64.0* (44.0-81.0)
Social functioning	100.0 (75.0-100.0)	75.0* (62.5-87.5)	62.5* (37.5-87.5)
Bodily pain	67.5 (57.5-80.0)	55.0* (45.0-67.5)	37.5*# (21.9-45.0)
Self-rated general health	70.0 (55.0-80.0)	60.0* (45.0-70.0)	45.0*# (30.0-60.0)

*P<0.05 vs.no disability group; # P<0.05 vs. low disability group

IQR = interquartile range for 25-75%, X^2-test